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SCHOOL AND SOCIETY

Volume XXIII SATURDAY, FEBRUARY 20, 1926 Number 582

AN OPEN MEETING UPON SCIENCE AND EDUCATION

AT the Kansas City meeting of the American Association for the Advancement of Science, held in December, 1925, a special program was presented under the auspices of the association's special committee on the place of the sciences in education. This program consisted of four papers as follows:

"The Purposes and Plans of the Committee on the Place of the Sciences in Education," by the chairman, Otis W. Caldwell, director of the Lincoln Experimental School, Teachers College, Columbia University.

"The Obligation to distribute Knowledge," by Dr. B. E. Livingston, permanent secretary of the American Association for the Advancement of Science, and professor of plant physiology, Johns Hopkins University.

"Action and Reaction in Education," by Dr. E. E. Slosson, director of Science Service. (Read by Dr. Vernon Kellogg, secretary of the National Research Council.)

"Science and Service," by Dr. Michael I. Pupin, president of the American Association for the Advancement of Science, and professor of electromechanics, Columbia University.

The papers are presented herewith. Reprints of the four and of this preliminary statement are to be secured and widely distributed as a part of the program of work by the committee.

THE PLANS AND WORK OF THE SPECIAL COMMITTEE ON THE PLACE OF THE SCIENCES IN EDUCATION

THE request for the appointment of this committee was first made to Professor James McKeen Cattell, then president of the American Association for the Advancement of Science. This request came from a group of college men who are working primarily in history, economics and other social studies. Professor Max Farrand, then professor of history in Yale University, in bringing the matter before President Cattell and others, expressed the conviction that the various programs and agencies dealing with the use of sciences in general education should be reexamined. It was hoped that resulting reports of general benefit might be secured. The organization of this committee was authorized and its chairman appointed at the third Cincinnati meeting of the association in 1923. Membership in the committee has been subsequently enlarged. The committee now includes twenty-six members, the membership being widely distributed geographically, in scientific interests and in educational connections.

In the preliminary conferences it became clear that two possible courses of action were open. The committee might accept the relatively brief task of preparing a report dealing with the opinions of its members and others regarding the functions of science in the life of our day. Or the committee might undertake: (1) the more prolonged study of facts and tendencies in science teaching; (2) the suggestion and possible guidance of specific investigations which are greatly needed; and (3) endeavor to secure organized efforts toward public presentations of science knowledge. The committee chose the more difficult course as represented by the three problems just named. An outline, published in SCIENCE for December 12, 1924, included brief statements regarding the following topics:

(1) "Purpose and Support of the Committee."
(2) "Previous Reports regarding Secondary School Science."

(3) "Summaries regarding the High School Science Situation."
(4) "Help desired by Those Who organize Science Courses."
(5) "Help for Those Who build Science Laboratories."
(6) "Needed Investigations of Science Teaching."
(7) "A Synthetic View of Science."
(8) "College Courses in Science."
(9) "Teacher Training Courses in Science."
(10) "Supply of Science Teachers."
(11) "Publications popularizing Science."
(12) "Scientific Method in Common Affairs."
(13) "What is Modern Science trying to do?"

Under the guidance of the committee, and with the helpful assistance of United State Commissioner of Education John J. Tigert, a bibliography of magazine articles dealing with science education has been published. This publication of 161 pages is available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the cost of 25c per copy. It is a volume of 161 pages, entitled "Bibliography of Science Teaching in Secondary Schools," United States Department of the Interior, Bureau of Education Bulletin No. 13 (1925). A supplement to this publication covering articles published in 1925 is in process of preparation.

For information and assistance in guiding specific studies, reports of previous studies have been distributed by the committee. Thus there were distributed a synopsis of the comprehensive study of sequence and registrations in sciences in all the four-year secondary schools of Pennsylvania; a reprint of the detailed study of "Science in California Schools," by Dr. Edna Bailey, Mr. Laurence F. Foster and Miss Florence G. Erwine; reprints of a study by Dr. G. W. Hunter on "The Place of Science in the Secondary School"; "A Description of the Science Laboratories of the Lincoln School"; a science library study, by Dr. Hanor A. Webb; and two special reports of science teachers' conferences, one of which was held during the past summer in each of the branches of the University of California.

One of the most needful tasks of the committee is that of assembling synopses of masters' and doctors' theses and other studies bearing upon specific teaching problems. Some of these studies are truly worthy of science. If all such studies may be summarized, if all studies in progress may be listed, and if other needed studies may be outlined, such a piece of work would provide help to investigators.

To-day's program concerns itself with the third and possibly most important of the committee's assignments, the desire to make science knowledge of more use to people. There is a genuine and insistent demand for better public information about the real nature of science and scientific study. In our form of government any one kind of thinking will have serious difficulty if it separates itself too completely or for too long a time from those who compose the majority of our citizenship. A thing may be right and still may be cast out if the great majority does not know that it is right. It has been said that the majority of one age is often the shame and wonder of the next age. There may be some heroic glory in being in the right with the minority, but science would gain more glory and do much service to humanity if the majority could more often know and believe in scientific truths and methods. How science may get itself known and understood by more of the people who are not now and are not likely to become scientists—that is a problem which science must solve if she expects the privileges and the social and economic support requisite for her future development. It is a problem worthy of the most profound and long-continued study. It is not a problem to be solved by hasty and superficial efforts. Too many of our efforts upon this problem have been intermittent, discontinuous and half-heartedly

fitted into the interstices of lives which are really devoted to other tasks. This is a major, not a minor task, and will require the full and devoted intelligence of many people. But it is a task essential in its consideration, not only for the sciences, but for men. We can not safely ignore the need of making the services of sciences really available to men and women of our progressive and thoughtful modern times.

OTIS W. CALDWELL

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THE OBLIGATION TO DISTRIBUTE KNOWLEDGE

IT is necessary that we distribute knowledge because we can not otherwise secure the full measure of our own satisfaction. It does seem to be as simple as that. In the first part of my paper I should like to present a brief preliminary analysis of human happiness from certain points of view and in relation to knowledge distribution. In my last paragraphs I shall ask your attention to an attempted classification of the several lines along which our educational activities, in the broadest sense, need to be directed, as it seems to me.

> Just to fill the hour, that is happiness. Fill my hour, ye gods, so that I shall not say whilst I have done this, "behold, an hour of my life gone," but rather, "I have lived an hour."

We may suppose that Emerson meant in these words to prefer a life of understanding and appreciation to one of less thoughtful occupation. The most satisfactory hours of one's life are those in which the things done seem to fit well with things in general as one appreciates them; we are happiest when we feel that our own small doings are in the direction of human progress; at any rate when they are judged not to be in opposition to that. The best appraisal of a period of our experience is not had at the time, however, but only later, when the period in question may be given a place in the long procession of the historical events that we know about. A thing is generally accomplished before it may be properly evaluated. Consequently, the perfect tense is eminently fitting in the quotation with which I began. Those hours are the best in which we find our occupation well fitted as continuation of the occurrences that have gone before and, as nearly as we may predict, not likely to be regretted at a later time.

In many times and in many tongues it has been pointed out over and over that personal happiness is hedged around with conditions and requisites that are never wholly fulfilled and attained. I imagine that most of us sometimes experience moods and periods when life seems, at least relatively, to be a vale of tears, a journey of disappointments. These are our hours of least happiness while they last, and often also when they are contemplated in retrospect. But a critical student of nature must realize that the emotional experiences called happiness and unhappiness, and their intergradations, are like other experiences in that they depend neither wholly on our continuously changing surroundings nor yet entirely on our fluctuating internal state of health and consciousness, but on an integration of influences from both within and without. Human happiness is perhaps proportional to our past ability to foresee what was then the future and to so manipulate ourselves and our surroundings as to arrange for satisfaction rather than for disappointment. Failure to fit ourselves into our environment and to fit our environment to ourselves—that constitutes unhappiness as soon as we find out that such failure has been ours.

My last clause suggests that ignorance may often be bliss, as long as it lasts, and thoughtful people will perhaps generally agree to that. But the future comes on apace and present ignorance of our present

and past inadequacy or unfitness will eventually be found out, and then will be an hour of reckoning. Mistaken happiness in the present may produce keen unhappiness in the future, as a sort of after-effect. In the long run, whatever may be true of short periods in our lives, it is not folly to be wise.

We realize that our lives are controlled by feelings and emotions more obviously than by knowledge and reason, but the more nearly we understand ourselves and the things around us the less likely we are to let our emotions carry us too far without some rational guidance. The most emotional of us do profit by experience; sanity does not burn its hand repeatedly by grasping the same red-hot iron. Each individual learns to guide his more primitive emotions in a more or less reasonable way or he could not live in society. Furthermore, the quest for knowledge and the exercise of reason are frequently motivated by less primitive feelings that are more characteristically human—the pleasure of approaching more nearly to truth, the pleasure of "being a good sport," of playing the game fairly, the metamorphosed selfishness of altruism.

An increasing knowledge of nature, especially of causal relations and more frequent opportunities for rational thought and intellectual enjoyment are surely bringing more and more hours of unregrettable happiness into the lives of the people of the more scientifically cultured nations. Not only are periods of well-grounded satisfaction more numerous and more frequent in the individual life, but surely also a larger proportion of individuals enjoy relatively happy lives than in any preceding period of man's development. Because of greater knowledge of themselves and of their human and non-human surroundings, individuals are better able to adjust themselves and make adjustments for themselves from hour to hour and from day to day. Because of this greater knowledge in some individuals, human environment becomes more and more modified to suit us without much thought on our part; indeed, the modifications that would be most needed had been prearranged for us in many cases before we were born. More than ever before, we consciously strive to adjust environment for others, of our own and of future generations. External adjustments of that kind must often prove to have been more or less mistakenly made, but the tendency is probably in the right direction on the whole, and mistakes will surely be progressively corrected as knowledge and understanding become more thorough and more widely spread. Similarly, as individuals we are better able to learn from the experience of ourselves and our contemporaries, as well as from experience of those who have preceded us, than has ever been the case before, and personal mistakes are now apt to be progressively less frequent or at least less fundamental, while their correction after discovery will surely be progressively more readily and efficiently accomplished.

My first emphasis rests on the biological thought that mankind, along with other living things, seeks happiness in legitimate activities, in continual readjustments of internal and environmental conditions. We are occupied in altering our surroundings and in changing ourselves or in taking account of changes that occur in us. The mirror in which we study the reflection of our acts is their subsequent effect on us. One of our deepest pleasures is to contemplate past happenings that are preserved in memory without too much regret. We add to our past experiences whatever knowledge we may possess of other natural phenomena and we react to all these and to the predictions of others as well as of ourselves, thus forming our present directly or indirectly out of our knowledge and appreciation of the past. Each act and thought is an ex-

periment that tests a prediction. Its appraisal comes afterwards.

In this connection I am not considering passive pleasure, happiness of inaction, *laissez faire, dolce far niente*, sleep, death, Nirvana. These are not things that healthy people of our race generally anticipate with great enthusiasm. When wearied, we do look forward to repose, but we usually see beyond the rest period to other periods of renewed and hopefully improved activity. We find within us an apparently innate urge to take some conscious part in the further evolution of our race and its institutions and of our world. There are probably quite satisfactory physiological reasons for this urge, mostly only very poorly known or hardly hypothecated at present, but we need not here inquire into this fascinating field of behavioristic psychology.

It is true that even the wisest and best of us, those whom we single out to praise and honor most, exist at these high levels of fused emotional and rational activity only during limited portions of their lives. Most of us seldom or never reach such levels. All of us sleep much of the time and do little better than vegetate during a considerable part of the remainder. The kind of happiness that is suggested by my quotation from Emerson is that of our alert and consciously active moments. It is fortunate for humanity that our lives are not all uniformly synchronized in these respects; some are watching and achieving while others sleep or "only stand and wait." After each period of relative inactivity we each wish to learn from the watchers concerning whatever may in the meantime have transpired that is significant and what has become resurrected out of our common past.

I have tried to traverse these familiar paths of thought from a starting point that, I think, rests rather firmly in natural and historical science as these stand to-day and from fundamental principles that are familiar to every one in the common experiences of daily life. We desire to be actively happy now and to be actively still happier in the future; we wish our lives to be productive of future satisfaction to ourselves and our fellows. We strive to adjust ourselves and our surroundings so that we shall not too often have left undone or unthought what we ought to have done or thought, so that we shall not too often have done or thought what we ought not.

To approach the accomplishment of such high desires it is necessary that we employ constantly as much as may be available of knowledge and understanding and appreciation of our present surroundings and of the history of our race and its environment. We need therefore to conserve and improve the agencies by which knowledge in any field may be most readily available to all of us. We need also to cultivate in ourselves facility in the use of these agencies. It is essential that we employ logic and the scientific method, especially judgment relatively suspended and the careful weighing of evidence according to the most proved methods with which we are acquainted. As a background for all our daily lives we greatly need a general knowledge of the fundamentals of the various fields of scientific endeavor; we need to appreciate as far as we may the evolutionary history of our world and of our race and institutions, the general story of how things have come to be as they are. We need acquaintance with what others have known and thought and felt, with rational and artistic literature, with ethics and with the esthetic field of the fine arts, with the various theologies and mythologies and magics that present the emotional and imaginative strivings of prescientific or unscientific endeavor to make life more satisfactory.

It appears that I have outlined a rather full program, one that no individual may well hope to complete with any satisfactory degree of uniformity. Division of labor is

surely essential in this. We approach our common problems from different angles, and the conscious cooperation of a number of different individuals whose outlooks on life are not too similar, nor yet too dissimilar, is surely very essential to hopeful progress.

The most time-honored obstacle to the achievement of human happiness remains to be called to mind. I mean the biological phenomenon of death, "from of old named king of terrors." Each individual and each generation takes part in the great relay race of human evolution and each retires at the end of a short period. Science has recently more than doubled the average length of the active period of each relay in some parts of the world and it may do much more in this direction, but the nature of things precludes the possibility of individual lives coextensive with the life of the human race. Each individual comes on the scene as nothing but a galaxy of potentialities and each must perforce first be born and then learn to run before he may undertake his part. Healthy reproduction is second in importance only to the minimum requirements for the individual physiological life. The biological basis of human progress must be maintained continuous at any sacrifice; individual happiness can hardly be conceived without assurance of this. And a very close third is education of the comparatively young. Next to the fundamental minimum needs of biological existence and reproduction, education of youth is the most insistently pressing human need. As every one knows, all efforts toward greater happiness would be quite futile without provision for this. The relays must be in readiness when the present runners drop out of the race.

Mention has been made of the fact that appreciative knowledge and the safe guidance of our motivating emotions are dependent on as thorough an understanding as is possible of the past as well as of the present of our world. It clearly follows that each generation must do its best somehow to transmit to the next succeeding generation as much as it may of its knowledge and of the results of its experience. Individual satisfaction with life can not be great in a civilized and cultured society unless the youth are supplied with means and prearranged guides by which they may secure rapid and easy introduction to their future activities. Especially must their general mental and emotional background of history, logic and language, of philosophy and science, be efficiently inculcated. Without such provision civilization and culture would promptly vanish.

This is of course an enormous task, and extremely delicate, but it can not be neglected without great subsequent regrets and unhappiness on our own part and on the part of those of the next and still later generations. Our emotions urge us to care for the education of the young and our best and deepest reasonings instruct us in the same direction.

Present knowledge of things and of the relations between things must be spread abroad just as rapidly as can be accomplished if our own true happiness and that of others is to be maintained and increased. Only in this way can our social group and the whole of humanity progress toward happier times. Our greatest need for the future is that every individual may approach the realization of his best combination of emotional and mental capacities. Whatever is ours of tested knowledge and experienced appreciation of the world and of ourselves belongs truly to everybody who cares for it, both in the present and in the future. Our own present and future satisfaction demand delivery of this knowledge as rapidly and efficiently as that may be accomplished. The lives of future generations will be more high and fine in proportion to our success in performing this naturally imposed task.

The distribution of knowledge may be seen to be necessary along three somewhat different lines, not, however, without much overlapping. First, observations, deductions, hypotheses and all useful products of human mental and emotional activity that have reached us from the recent or remote past are to be made available to our active contemporaries. Second, they are to be made available to our youth, in preparation for their approaching activities. Third, they are to be placed on record in suitable ways so as to be available at any time to those who follow us. The machinery for accomplishing this three-fold service is already well developed and highly complicated, but it can and surely will be still further greatly improved.

From another point of view, we may say that there are in general four sorts of knowledge distribution to be maintained, according to the mental status of those for whom it is intended. These four categories are as follows:

(1) The distribution service to specialists in the particular knowledge realm in which the distributed material lies, research workers, experts and teachers in the special branches.
(2) The distribution service to trained and specially able minds in other knowledge realms, scientific people as a group.
(3) The distribution service to mature but not specially trained minds, the general public.
(4) The distribution service for the education of youth.

These four kinds of extension work, if I may use a well-worn expression of educational institutions, will generally serve future generations as well as the present one. Printed material and pictures work on after authors have departed. Only the spoken word, with its special adaptability and inspiration, fails to reach indefinitely down the years. Yet perhaps it is possible that libraries may come to preserve phonographic records of specially valuable lectures and the like. At any rate, it is no small accomplishment of applied science that an address can now be actually heard even thousands of miles from the speaker.

With this great task of distributing knowledge we must be constantly engaged, and later generations must continue to carry on. The task is as endless as is the duration of humanity and the growth of knowledge. But it varies in method and means as evolution proceeds and it has unsurpassed capacity for supplying us with well-filled and happy hours over which there are not likely to be serious subsequent regrets.

BURTON E. LIVINGSTON
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ACTION AND REACTION IN SPREADING SCIENCE

THE development and expansion of science encounter various kinds of obstacles and opposition; some due to the inherent defects of the scientists themselves, and some due to the innate inertia of the human mind. I will discuss the former first.

Bacon, in one of the most enlightening passages of that most enlightening book on "The Advancement of Learning," describes the various "diseases of learning," one of which is stoppage of growth by premature maturity. This abnormality in the case of individuals is, I understand, ascribed to a disturbance of the balance between the thymus and the thyroid glands, and this theory is evidenced by direct experiment. By feeding tadpoles with thyroid extract we speed up maturity and get dwarf frogs. By feeding tadpoles with thymus extract we prevent maturity and get giant tadpoles but not frogs.

The time has come when some one ought to go over Bacon's acute diagnoses of mental maladies and interpret them in the light of our present knowledge of social psychology. For when we survey the present state of the sciences we can discern many signs of hypo- or hyper- thymus or thyroid activity. We see sciences that are in the dwarf

frog state and others that are in the giant tadpole state. It will be safer for me not to specify them in public. You can easily identify them for yourselves—and to yourselves. In looking over the history of science we observe periods of accelerated growth and of arrested development, as we do when we examine the curves of the mental and physical development of children. For instance, no contribution was made to the world's knowledge of magnetism for twenty-four hundred years from the discovery of the lodestone by the Greeks before 800 B.C. to the publication of Gilbert's book in 1600 A.D. Geometry was in a state of arrested development from Euclid to Lobatchewsky, a period of about twelve hundred years.

These sciences were awaiting the secretion of the necessary hormone. Galileo was such a hormone in astronomy, Darwin in biology, Einstein in physics.

In the social organism, as in the human, growth and health are dependent upon the continuance of the secretion, and when such human hormones as these cease to appear for a century or so the science makes little progress, or even degenerates owing to the accumulation of waste products of metabolism. There are even to-day, when all the sciences have been stimulated to unprecedented vigor through cross-fertilization, certain branches that have practically ceased to grow but which continue to clog up the bibliographies with as large a production of papers as in their palmiest days. What they need is the rest cure. The field should lie fallow for awhile and then it would again be found fertile and worth cultivating.

Bacon points out that sometimes a science will deteriorate while a mechanical art will continue to progress:

> As for the overmuch credit that hath been given unto authors in sciences, in making them dictators, that their words should stand, and not counsellors to give advice; the damage is infinite that sciences have received thereby, as the principal cause that hath kept them low, at a stay without growth or advancement. For hence it hath come in arts mechanical the first deviser comes shortest, and time addeth and perfecteth; but in sciences the first author goeth furthest, and time leeseth and corrupteth. So we see, artillery, sailing, printing, and the like, were grossly managed at the first, and by time accommodated and refined; but contrariwise the philosophies and sciences of Aristotle, Plato, Democritus, Hippocrates, Euclides, Archimedes, of most vigour at the first, and by time degenerate and imbased; whereof the reason is no other, but that in the former many wits and industries have contributed in one; and in the latter many wits and industries have been spent about the wit of some one, whom many times they have rather depraved than illustrated. For as water will not ascend higher than the level of the first spring-head from whence it descendeth, so knowledge derived from Aristotle, and exempted from liberty of examination, will not rise again higher than the knowledge of Aristotle.

This is not so true now as it was when Bacon wrote, largely because of him. Undue deference to authority is not nowadays a serious evil and even the most revered of the saints of science are not "exempted from the liberty of examination." The sciences now advance continuously, like the arts, by the gradual accretions of knowledge due to the activity of many workers. The method of scientific discovery that Bacon outlined has become a working program by which progress can be made for considerable periods even in the absence of original genius. We need great men as much as ever, and their opportunities are greater than ever, but we can get along without them better than before. Research has been systematized like commercial and industrial methods and has thereby gained in efficiency, provided in both cases that the system does not become supreme, and the energy be not used up in the running of the machine.

But there is in science the same tendency as has caused so much trouble in philosophy and theology, the disposition to expand a single idea into a universal dogma; to try

to unlock all the secrets of the world with a single key. Mounted on his hobby the scientist will ride it for all it is worth, and often much farther.

Here again I must cite Bacon.[1]

> Men have used to infect their meditations, opinions, and doctrines, with some conceits which they have most admired, or some sciences which they have most applied; and given all things else a tincture according to them, utterly untrue and unproper.
>
> So have the alchemists made a philosophy out of a few experiments of the furnace; and Gilbertus, our countryman, hath made a philosophy out of the observations of a loadstone.

A striking illustration of this comes in the current controversy over evolution. The Germans boast that "without Haeckel there would have been Darwin but no Darwinismus." Perhaps that is true, but has "Darwinismus" been an advantage to the science on the whole? Certainly it has made more enemies. Herbert Spencer's little essay on "Progress" was brilliant and stimulating, but when he expanded it into sixteen volumes of a synthetic philosophy of evolution and made it cover the universe past, present and future, its value was lessened and its dangers increased. Karl Marx, whose theory of capital was erected into a dogma by the socialists even in his lifetime, used to say: "Thank God, I am no Marxian." So, too, Darwin was not a "Darwinian" in the modern sense of the word.

But very curiously and unfortunately Darwin, who was himself quite unconcerned with speculative theories, got into trouble through inadvertently adopting a metaphysical term. He did not believe in the objective existence of species, but by taking his terminology from Linnaeus and entitling his work "The Origin of Species," he carried over unto the field of biology the old Greek conception of eternal prototypes; the Platonic idea of absolutely distinct, perfect and unalterable models of all things. Of course the modern botanist and zoologist has no such idea in his mind when he uses the word "species." He knows that no two individuals are alike, that their forms are changeable and that it is often impossible to draw a line between different species. A large part of his field work and most of his controversies are due to this difficulty of classification. If he has any definite idea of the species as a unit, it is a particular specimen in a certain museum or a mean about which the variations are grouped. He does not think of a perfect, permanent and imperishable archetype stored away in some heavenly museum of ideals.

But theologians, being trained in the classical tradition, or inheriting it, unconsciously adhere to the Platonic meaning of the word "species." From their point of view to talk of the "origin" or "transmutation" of species is not only impossible, but absurd; as absurd as if a mathematician should claim to have drawn a square circle or a biologist to have grown a two-year-old calf in a minute. Since the two opposing parties are talking different languages, even when they are using the same words, neither can make any impression on the other. It is, I think, Greek philosophy rather than Hebrew cosmology that causes the quarrel. If Darwin had avoided this controversial word, of whose philosophical implications he was probably unconscious, and if he had talked instead about "variant forms" or had invented a synthetic word like "kodak," he and his successors would have been saved much trouble, misunder-

[1] I know that I am overfond of Bacon but there are two reasons for it: one is that whenever I am trying to work out an idea I generally find, if I take down my Bacon, that he has expressed it so much more clearly and succinctly than I could that I strike out what I have written and substitute his words; and second, that Bacon is not so much read now as he should be, and if you prefer to listen to me when you might better be reading your Bacon, it is my duty to see that you do not suffer from your choice, however injudicious it may be.

standing and opposition, lasting even to the present.

In considering the extension of scientific knowledge and in particular the inculcation of the scientific method of thought, we must beware of being misled by convenient analogies. For instance, it is common to symbolize knowledge by light and ignorance by darkness. The metaphor is as old as science itself, yet it is essentially misleading, for darkness is negative, is nil, offers no resistance whatever to the diffusion of radiant energy. Empty space is no impediment to radiation. The ether, if Einstein still allows us an ether, absorbs, so far as we know, nothing of the rays of light that pass through it from stars and sun. Heat meets no opposition from cold, for cold is after all a fiction of man's imagination, created for the purpose of balancing up heat, in much the same way as Satan was postulated by the Manicheans for the purpose of forming a counterpart to God.

But ignorance is not an inert entity, a negative fiction offering no resistance to the expansion of knowledge. No cranium contains a vacuum. It is always filled with something, and, in the case of certain individuals, filled with matter which is impenetrable, or at least difficult to make an impression upon.

In actual life ignorance is allied to conservatism, and the combination is a strong one. In order to introduce a new idea into the mind of man, it is generally necessary to eject an old idea. The eviction process often has to be accomplished by violence. Even a child's mind is not a *tabula rasa*. It is, on the contrary, a palimpsest written over with previous inscriptions from Paleolithic times to the present. To move in new furniture one has first to move out the old.

When I was a boy there was a popular trick which not only gave us an opportunity of inflicting a little annoyance upon a companion not in the secret, but which illustrates a physical, and it seems to me also a psychological, principle. It consists in placing the pellet of cork the size of a pea in the mouth of a bottle held on its side, and asking your friend—who was a friend before the experiment had been tried—to blow it in. He, seeing the bottle was quite empty, undertook to blow the pellet in with a puff, but was surprised to find it fly back into his face. The harder he blew the smarter was the blow he received in return. But taking the bottle into your own hands you showed that the bit of cork could be easily got into the bottle by coaxing it with gentle breathing applied at the proper point. The brusque method involved a great waste of breath, besides being unsuccessful.

Now it seems to me that the introduction of a new idea into the world involves the same process as the blowing of the cork pellet into the bottle. It meets with an unseen resistance and the more vigorous the blowing the more energetic the reaction. The bottle is not empty, although it seems so, and to get the cork in an equivalent volume of air must be previously expelled.

So we find that a novel conception, especially one so fundamental as to involve a reconstruction of the mind, a reorganization of its existing knowledge, meets with active opposition.

Samuel Butler in his "Notebook" says that there should be a law against telling people things they do not want to know. Such a law is unnecessary because the instinctive reaction of the mentality of the masses is quite sufficient protection. We all of us are afflicted with this psychic deafness when it comes to hearing unwelcome and disturbing ideas. Neophobia is a common malady of the human mind. No one probably is altogether exempt from it, even the great men. Scientific men who are by profession supposed to have an open mind and to welcome eagerly anything new, often turn their deaf ear to unwelcome tidings, or, like Nelson, put the telescope to their

blind eye. As Dr. Oliver Wendell Holmes said, one who has in his time pushed forward a little the ear of progress seems to feel himself entitled to catch on behind and ride all the rest of his life.

A new idea comes first in the mind of one man. That means that the new idea starts out in the world with a majority of 1,600,000,000 against it. If any of the innovations in scientific thought were put to a popular referendum they would be voted down by overwhelming majorities for the first hundred years or longer. If a plebiscite on the question of whether the earth is round and revolving or flat and stationary were put to a plebiscite of the entire world at the present time and compulsory voting were required, the Copernican theory of the universe would be repealed by an immense majority. Newton's law would never have been passed if it depended upon a popular vote.

The principle applicable to the spread of scientific conceptions, as of all novel notions, is I think the same as is known to the physicist as the theorem of Le Chatelier. This is stated in Taylor's "Treatise on Physical Chemistry" as follows: "If a change occurs in one of the factors determining a condition of equilibrium, the equilibrium shifts in such a way as to tend to annul the effect of the change."

This principle prevails in all natural phenomena and is familiar to us through many practical examples. For instance, if we increase the pressure on a gas a change takes place. The gas accommodates itself as far as possible by changing to such a form as to decrease its volume and so reduce the effect of the increased pressure. The addition of heat to a substance does not raise its temperature if the substance can rearrange its structure in such a way as to absorb heat. For instance, the application of heat to ice at zero centigrade does not raise the temperature because it passes from the solid to the liquid state, and so long as there is any ice left the temperature remains at zero. Water expands on freezing to ice but, in accordance with the theorem of Le Chatelier, a high pressure will prevent the freezing of ice at zero.

In other words, whenever anything in nature is subjected to an outside force it shows a reluctance to conform, and finally accommodates itself to the external influence by as little internal alteration as is possible. All bodies are by nature nonconformists and summon to their aid all the forces of physics and chemistry to resist the attempt to transform them. That is true also of the human reaction, both physiological and mental. If a burden is put upon the back of a man he leans forward to balance it. If he is pushed in a crowd he slips on one side in order to evade the pressure, unless indeed he is of a pugnacious disposition, in which case the reaction is equal to the action and often greater.

The nature and cause of this popular reaction to innovations is well expressed by F. C. S. Schiller, of Oxford:

> Deep down in the heart of man lives a chronic *Fear* of the weird world in which he finds himself so inexplicably plunged and is so imperiously prompted, by hereditary instinct—and the fear of greater evils—to struggle for his existence to the last breath. This Fear is usually kept under by the fabricated order of the social life, and kept drugged by the traditions, conventions, creeds, and mechanisms of a social *routine*. But under abnormal conditions it breaks out, and renders him a prey to wild and senseless "superstitions"; which are in truth survivals from the times when as yet no "science" had been devised to reassure men by its claim to curb the chaos of happenings, superstitions which still betray our unavowed distrust of the exorcisms of the verbal formulas which we significantly call the *laws* of nature—in the *hope* that nature will obey them. This Fear moreover begets not only the superstitions but the gods; we may expect to find traces of its universal influence, *camouflaged* of course, disseminated also through the doctrines of the sciences, and revealing itself as an obstinate bias or persistent prejudice against such endeavours as run counter to it.[1]

[1] From "Studies in the History and Method of Science," by Charles Singer, Volume II, Clarendon Press, Oxford, 1921.

This instinctive mass reaction against new ideas finds expression in many ways much more immediate and powerful than legislation, which is a belated and clumsy way of expressing popular feeling. It is essentially the same as the common aversion to a foreigner. The foreigner that is feared may not come from as far as China or India, but may be from the next village if the mental horizon is limited. The slogan of the English village is: " 'E's a stranger. 'Eave 'arf a brick at 'im," and the "stranger" may have merely walked in from the next shire, or he may be a native who has shown himself outlandish in costume or conduct.

The education of adults is more difficult than the education of children because the brains of elders are all cluttered up with ideas that have to be cast out or moved about to make room for the new notions. We have nowadays loose-leaf ledgers and encyclopedias, and we need loose-leaf brains so that we can keep our mental store of knowledge up to date. Such expandable minds are particularly desirable at the present time when the increase of knowledge through organized research is so rapid and revolutionary.

An idea seeking entrance into the common mind is like another passenger trying to get into a crowded street car and the same rules apply. The first of these rules is "Watch your step!" Many an important truth, in trying to get aboard the car of progress, has put the wrong foot foremost, or, underestimating the gap in the step, has missed its footing, and been crippled, or has had to wait for the next car, which perhaps did not come along for fifty or five hundred years.

The next injunction that is howled at us when we take a street car is "Move up front!" This also should be followed by those who are trying to introduce new knowledge. There is more room at the front because ideas, when they first enter the mind, tend to congregate at the door and so to exclude later arrivals, as they formerly had been kept back. Huxley says:

> History warns us that it is the customary fate of new truths to begin as heresies and to end as superstitions.
>
> The struggle for existence holds as much in the intellectual as in the physical world. A theory is a species of thinking, and its right to exist is coextensive with its power of resisting extinction by its rivals.

One can lay contradictory ideas up in one's brain side by side like books on a shelf. But you can only do that with the dead ideas. Live ideas brought into contact quarrel with each other and get knocked about.

It must be remembered that we are dealing here with a general reaction of the human mind, and that each advance in religion, as well as in science, meets the same instinctive reaction of opposition. New ideas in any field act as ferments in the mind and have the power of effecting a transformation of the entire mass. This enzyme action of a new idea is pointed out by Jesus in Matthew xiii, 33. The word "gospel" means "good news" and the opposition it encountered was not merely because it stipulated a stricter mode of life, but because it was "news."

The same principle of the opposing reaction to novelty is as noticeable in the most trivial deviations from conventional customs as it is in changes in our fundamental conceptions of the universe.

Apuleius came near being condemned to death on the equally grave charge that he had used a dentifrice and had dissected fishes to learn anatomy.

At the end of the tenth century when a high-born Italian lady ventured to use a fork instead of her fingers when eating, all Venice was scandalized, and the chronicler Dandolo records that heaven punished her depravity by afflicting her with a loathsome

disease. When Coryat returned from Italy to England with a table fork, he was subjected to ridicule. Nowadays Americans strive strictly to follow the injunctions of their *arbiter elegantiarum*, Ward McAllister, whose dying words are said to have been: "Everything that *can* be eaten with a fork, *must* be."

Any deviation from the established code of manners, irrational as this may be, is speedily penalized by social displeasure and indeed ostracism, as we may see from the advertisements of books on etiquette. The uninformed parvenu in refined society who picks up the wrong table utensil or offers the wrong arm to a lady suffers as much from the offence as the unconscious victim of halitosis.

The use of coal and the introduction of the locomotive, which have been the chief factors in the development of our modern civilization, would have been prevented at their inception if public opinion had possessed the power to enforce its opposition. In 1306 King Edward I issued a proclamation making the use of coal as fuel in London a capital offence, and one man was actually executed for the crime. The wealth of Pennsylvania has come chiefly from its coal beds, yet the man who first attempted in 1803 to sell a wagonload in Philadelphia was prevented under penalty of the law.

In 1825 *The Quarterly Review* demanded that Parliament limit the speed on all railroads to eight or nine miles an hour.

In 1804 the British Admiralty declared that "the introduction of steam vessels was calculated to strike a blow at the naval supremacy of the Empire." As a matter of fact it turned out that the steam vessels, which the Admiralty had the desire but lacked the power to prohibit, have greatly extended the naval supremacy of the British Empire.

In 1840 Peter Hele, of Nuremberg, was accused of witchcraft, by his neighbors and his wife, because he had invented a ticking clock.

In Indiana in 1844 Lew Wallace, father of the author of "Ben Hur," was defeated for reelection to Congress because he had voted for an appropriation for a telegraph line between Washington and Baltimore, thus, as his opponent said, "encouraging some crank who has a fool idea he can send messages by lightning."

To come down to our own day, the transatlantic liner which recently adopted the Diesel engine as a substitute for the steam engine was obliged to erect two huge and useless smokestacks in order to resemble the steamers of competing lines, because passengers refused to patronize a vessel which did not have these familiar and visible signs of its engine power. One of these pseudo-smokestacks is used for a ventilator and the other for an elevator.

All through the history of science we find that new ideas have to force their way into the common mind in disguise, as though they were burglars instead of benefactors of the race.

The will to prevent the admission of new truth is, we must assume, always present in the popular mind, but fortunately the power to enforce it is not always sufficient. Legislation, though sometimes effective at first, proves usually futile in the long run. If any one would take the trouble to look up the state laws and municipal regulations of any of our older states, he probably would find the statute book filled with unenforceable regulations directed against novelties on their first appearance in the community. Such laws, for the most part, have been unrepealed, but in time fall, as Governor Cleveland said, into "innocuous desuetude." Democracy, which is born of freedom, may in turn strangle its mother.

Let me conclude by quoting two prominent thinkers of the past on the inadvisability and futility of the repression of unconventional opinions:

It is unnatural and unreasonable to persecute disagreeing opinions. Unnatural, for understanding being a thing wholly spiritual, can not be restrained, and, therefore, neither punished by corporal affliction. It is *in aliena republica* a matter of another world. You may as well cure the colic by brushing a man's clothes, or fill a man's belly with a syllogism.

In process of time, many important discoveries have been gradually assented to as prejudice could give place; for, allowing that it takes a century to make a discovery, it requires another century to remove prejudice. Such is the force of attachment and the power of habit that when one's mind is established in wrong, it will hardly be restored to right. In those minds wherein ignorance and indolence have conspired against truth, such a conspiracy is too formidable to permit the hope of speedy reformation of popular wrong. The uncultivated mind is more prone to judge than to investigate, to censure than to aid, and indeed, in general, there is not a more certain criterion of ignorance than hasty and inconsiderate judgment.

These two quotations express the demand for freedom against the interference with the dissemination of scientific knowledge as well as they could be worded by any man of science. Yet I have selected them, not from any scientific authors, but from two of the most revered of orthodox divines. The first is by the Rev. Jeremy Taylor, author of "Holy Living and Holy Dying," and the second is by the Rev. John Wesley, founder of the Methodist Church. These show that the fight of knowledge against ignorance is not a conflict between science and religion, but essentially their common cause against a common fault of the human mind and mass psychology.

EDWIN E. SLOSSON
DIRECTOR OF SCIENCE SERVICE,
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THE INVISIBLE SERVICE OF SCIENCE

SERVICE of science reminds us first of the visible service of science, which one can see in every nook and corner of our daily life. But there is an invisible service of science which has a purely intellectual, esthetic and spiritual value. This is the service to which I wish to call your attention. In this connection permit me to point out at this very outset that during the last three hundred years, since the pilgrim fathers landed at Plymouth Rock, science has revealed three distinct physical realities. The first physical reality was revealed through the science of matter in motion; the second, through the science of electricity in motion, and the third, through the science of cosmic energy in motion. Each one of these contributes a service which is not visible in every nook and corner of our daily life; but it has an intellectual as well as an esthetic and spiritual value.

THE SCIENCE OF MATTER IN MOTION

The first physical reality, revealed by the science of matter in motion, announced its approach three hundred years ago, when Galileo discovered the concept of acceleration and its relation to the moving force. A hundred years later Newton finished the work which Galileo had commenced; he placed the crowning dome upon the beautiful intellectual structure, the foundation of which had been laid by Galileo. The Galileo-Newton science of matter in motion, the science of dynamics, is this intellectual structure. It revealed the first physical reality which is our earliest scientific knowledge of the material universe. Nothing exhibits the beauty of this reality so well as the contemplation of the motion of the planets around the sun. Here we have a cosmic system of bodies, in which each part moves along a definite path with a precision unattainable in any mechanism constructed by the hand of man. And yet the only guiding force in this perfect order is the gravitational action of matter, operating according to laws of childlike simplicity. Michelangelo rendered immortal service to the intellectual as well as to the esthetic and spiritual activity of the human soul, when he

impressed his genius upon that magnificent edifice on the Vatican Hill, St. Peter's basilica in Rome, and Newton, the Michelangelo of the science of dynamics, rendered to mankind a similar, but immeasurably greater service, when through his science he gave a new meaning to the most sublime edifice known to man, to the starry vault of heaven.

Science of Electricity in Motion

The second physical reality revealed itself through the science of electricity in motion. Among those who laid the foundation to this physical reality, Faraday must be mentioned first. He discovered the meaning of acceleration in electrical motions; he is the Galileo of the electrical science. But who is its Newton? Sixty years ago Maxwell spoke like a prophet when he made the startling announcement that radiation of light and heat is a manifestation of moving electricity. The prophecy came true and Maxwell rose to the lofty position of a Newton of electrical science. The achievements of the electrical science during the last sixty years are the fruits of our efforts to find a complete interpretation of Maxwell's prophecy. The greatest among them is the discovery that the origin of all radiation is in the motions of the tiny electrons which are, as far as known to-day, the immutable primordial building stones of the material universe. Atoms have been revealed to us as complex structures, made up of positive and negative electrons, the unchangeable granules of that subtle substance which we call electricity. Everything that moves and has its being in this boundless universe seems to be deriving its breath of existence from the electrical forces which have their origin in the tiny electrons. The combined activities of these infinitely small but infinitely numerous workers is the activity of that stupendous unit, called the universe. The book of Genesis, composed by a Moses of modern science, would probably start as follows:

> In the beginning God said: Let electricity move, and the embryo of the universe began to form.

If the contemplation of this physical reality does not uplift the soul of man and stimulate its intellectual and esthetic as well as its spiritual activity then St. Paul was in error when he said: "We all with open face beholding the Glory of the Lord are changed into the same image from glory to glory. . . ."

The Science of Energy in Motion

These two physical realities prepared the human mind for a third physical reality which is being revealed to us through the motion of cosmic, that is, of radiant energy. The concept of energy is a comparatively new concept, and its full meaning dawned upon us less than a hundred years ago. To-day we know that the background of every physical phenomenon is a transformation of some form of energy. We also know that the total energy content in the universe is constant, but that its parts are wandering through space, as if in search of opportunities for benevolent service. Each star radiates its energy to other stars, and our little terrestrial globe would be a sad and barren abode if it did not feed upon the life-giving energy stream of solar radiation.

This radiation proceeds from countless tiny electronic centers, each one of them attending strictly to its own activity and paying no attention to the activity of its neighbors. It is a chaotic activity of an immense number of essentially autonomous workers. Hence solar radiation is a most chaotic swarm of countless energy units, and yet their service on earth shows that beautiful order which is the fairest adornment of our terrestrial globe. Just watch the clouds of the summer day, moving, like Milton's heavenly host, in stately procession, and

carrying relief to the thirsty continent. Remember then that the power behind this gigantic labor of beautifully ordered service is the chaotic energy stream of solar radiation. Here is a transformation of a chaos into a cosmos, a revelation of a new physical reality which gives a concrete meaning to the belief of ancient Greece that the creation of the world is a transformation of a chaos into a cosmos. A new science is rising in the background of this physical reality. Its foundation was laid a hundred years ago by that great savant, Sadi Carnot, who is its Galileo. But who is its Newton? Not only has he not yet appeared, but the science has not yet received its appropriate name. I call it, for want of a better name, "the science of coordination."

Carnot told us how the chaotic molecular activity, called heat, can be transformed into orderly service by interposing a heat engine in the path of heat in its passage from a higher to a lower temperature. The engine is a guide, a coordinator, of the chaotic heat energy. Similarly a galvanic cell is a coordinator of chemical activity which is chaotic when unguided. The caloric engine and the galvanic cell are coordinators invented by man. The guiding operation is performed in accordance with the designing intelligence of man who has a definite purpose in view. But what is the coordinator which transforms the chaotic solar energy, absorbed by the leaf of a plant, into a coordinated service which manifests itself in the orderly growth of the plant?

Each organic cell as a whole and all of its microscopic and ultra microscopic components feed, grow and divide in an orderly way; they transform chemical activity, which is chaotic when unguided, into orderly work and service. Is there a guiding coordinator attached to each one of these tiny organic units, and if there is, does it operate in accordance with some intelligent design and purpose as is the case in the caloric engine and the galvanic cell? What function, if any, does the recently revealed radiation of marvelous penehability play in the physico-chemical processes of the organic cells? One can not resist the temptation of asking this question, because it suggests the possibility of finding a new relationship between new cosmic processes and the tiny living cells on earth. Some future Newton will answer these questions; in the meantime the contemplation of the physical reality of which these questions are a part can not fail to furnish that intellectual, esthetic and spiritual exhilaration which is the noblest service of science to the human soul.

M. I. Pupin

Columbia University

EDUCATIONAL EVENTS

THE DEATH OF SUPERINTENDENT VAN SICKLE

Dr. James H. Van Sickle, whose career as a superintendent of public schools and as a lecturer on school administration won him a national reputation, died suddenly from angina pectoris at Miami, Florida, on February 12. He was in his 74th year. Following his retirement as superintendent of schools of Springfield, Mass., in 1923, Dr. and Mrs. Van Sickle lived at Pocono Lake Preserve, Pa., in the summer and at Dade City, Florida, in the winter, and recently made their home at Coral Gables, Florida.

A native of Livingstone County, N. Y., Mr. Van Sickle attended the New York State Normal School at Albany, graduating in 1873; studied at Williams College, 1876–77, and later took work at the University of Colorado, where he received his A.B. degree in 1896 and his A.M. in 1898. In 1905 he was given the honorary Ph.D. degree at Albany.

He was a teacher successively in the public schools of New Providence, N. J., Caledonia, N. Y., and Havana, N. Y., and then, going west, he served in the public schools of Denver, Colo., from 1890 to 1900 as a city school principal and as superintendent of the north side schools.

In 1900, Mayor Hooper, of Baltimore, invited him to become superintendent of public

instruction of Baltimore. In carrying through his program there Dr. Van Sickle encountered much opposition and a situation developed which, with the election of Mayor Preston, and ousters and replacements in the school board, led to Superintendent Van Sickle's dismissal in July, 1911. He was at once offered the superintendency of schools of Springfield, Mass., at the largest salary the city had ever paid. He accepted and served at Springfield from 1911 to his retirement in September, 1923, at the age of seventy-one years.

Dr. Van Sickle was widely known as editor of the "Riverside Readers" and of "Pilot Arithmetics." He served as a lecturer on school administration at the University of Chicago, Yale, Cornell, Harvard and the University of Tennessee, during summer and other sessions. He directed school surveys in Connecticut, Massachusetts and Pennsylvania. From 1908 to 1913 he was president of the American School Peace League and in 1909 was president of the Southern Educational Association. The survivors are Mrs. Van Sickle, two daughters and two sons: J. B. Van Sickle, of the faculty of the University of Michigan, and Schuyler Van Sickle, of the Springfield, Mass., High School.

THE PERSIAN INDEMNITY AND THE EDUCATION OF PERSIAN STUDENTS

CONGRESSMAN STEPHEN PORTER, of Pennsylvania, chairman of the Foreign Affairs Committee, has introduced in the House of Representatives a bill by which the $110,000 to be paid by the Persian government following the murder in Teheran of Robert W. Imbrie, American vice-consul, would be used to educate a number of Persian youths in the United States. The proposed plan is similar to the Boxer indemnity arrangements by which Chinese students have come to this country.

The use of the indemnity for educational purposes has been endorsed by the Department of State, and Allen Dulles, chief of the division of Near Eastern Affairs of the Department, was before the committee last week, in support of the Porter bill. The bill declares that the devotion of this fund to educational purposes would be "deemed proper as an act of friendship, tending to promote a closer relationship and a better understanding between the peoples of the United States and Persia." The argument is also made that such a use would do much to add to the prestige of the United States in the Near East.

Opposition to the plan was made before the House Foreign Affairs Committee last week by Congressman Gifford, of Massachusetts. As reported by Oliver McKee, in a special dispatch to the Boston *Evening Transcript*, he urges that at least half of the $110,000 should be awarded to the widow of Vice-consul Imbrie. So far, Mrs. Imbrie has received but $60,000 from the Persian government, this sum being awarded under an agreement between the two governments.

Congressman Gifford holds that the indemnity paid Mrs. Imbrie is grossly inadequate, and that it reflects no particular credit on the United States that we should let Persia off so easily. It is understood that Mrs. Imbrie has documentary evidence to show that the Persian government offered her a much larger sum, said to be as high as $250,000, but that she refused this, preferring to let her own government negotiate with the Persian government.

AN ENGLISH SCHOOLMASTER'S COMMENT ON AMERICAN PRIVATE SCHOOLS

DR. MONTAGUE JOHN RENDALL, former headmaster of Winchester College, England, and now traveling commissioner of the Rhodes Trust, addressed the Philadelphia Branch of the English-Speaking Union on February 9, shortly before sailing for Bermuda and Jamaica. Dr. Rendall gave his observations on private schools in the United States, based upon his recent visit to schools, largely in New England and the Middle Atlantic States. He avoided references to the public high schools and secondary schools, with which he said he is not acquainted.

Praising the character and the spirit of the boys in American private schools and the earnestness of their teachers, Dr. Rendall said his criticism was in the friendliest spirit and related to the system followed and not to those engaged in it. The results attained in the great English public schools are far superior, he declared, and he ascribed this to the training of boys in Latin from their early years.

"Latin is the finest instrument ever offered

for the education of the adolescent intellect. In this country you are making a grave blunder when you deprive your fine boys of it until they are 13 or 14. Give them enough of Latin early and you needn't teach them English, or English grammar at all. This medieval thing is the foundation of all culture of the mind and the lack of it explains the half-heartedness with which boys enter into the system of American private school education."

Dr. Rendall made it clear that he applied this to the selected youths who can be given the best training, but he added that "if a boy is going to operate a machine at 18, he will grasp all the essentials the more speedily if he has had a good training in Latin."

"By educating down to the ability of the less intelligent you are stifling genius and you are canonizing mediocrity," Dr. Rendall continued. He maintained that in the colleges and universities in America young men are doing work that ought to have been done before they entered college. "They are wasting their riper educational years in fiddling about with small pieces, when they ought to be making a whole fabric out of smaller parts assimilated earlier."

Tracing the best that is in sport to the code of chivalry, Dr. Rendall said that in England and in the United States this code is endangered by the tendency to consider the "gate" and financial aspects more than the game itself.

In closing, Dr. Rendall praised the Rhodes scholars who are going to Oxford from American colleges and universities. "You are sending some of the best we have in the university and we rejoice to honor them."

A NEW STUDY OF COLLEGE FRATERNITY SCHOLARSHIP

The Interfraternity Conference, composed of fifty-eight local and national college fraternities, took action at its meeting in New York last November looking toward a survey of student scholarship among the national fraternities. A permanent committee on scholarship was appointed to make a study "to take, if need be, five or ten years for the consideration of the problem."

As a first step the executive committee of the Interfraternity Conference is now in communication with the American Association of Collegiate Registrars, from which a suggestion was received "suggesting that some action be taken to establish a uniform system of recording scholarship, a uniform statement as to who are members of a chapter and a uniform rating of members who withdraw from a chapter during any given semester."

The following resolution was passed by the executive committee of the Interfraternity Conference at a recent meeting:

Whereas, The Interfraternity Conference has, from time to time during the past eighteen years, made investigations into the scholastic standing of both fraternity and non-fraternity men in the colleges and universities of the United States; and

Whereas, These investigations have been seriously handicapped and the results thereof rendered largely nugatory by reason of the fact that the systems of marking and rating vary so widely in the various institutions of learning; and

Whereas, The Interfraternity Conference is about to make the most far-reaching and intensive study of the said scholarship situation in its history, and is prepared to spend a substantial sum of money thereon; and

Whereas, It is the purpose of the Interfraternity Conference, in cooperation with the various institutions of learning, to do all in its power to make the fraternities a constructive force for better scholarship among college men; now, therefore, be it

Resolved, That the Interfraternity Conference respectfully requests the American Association of Collegiate Registrars to urge the adoption of:

(1) A uniform system of compiling the scholastic records of both individuals and groups.

(2) A uniform practice of determining who shall, for rating purposes, be regarded as members of a fraternity chapter.

(3) A uniform attitude toward the inclusion of the marks of men who have withdrawn from college during the term or have been excluded by expulsion or suspension from active membership in their fraternities.

THE TEACHING OF EVOLUTION IN THE SOUTH

An Associated Press dispatch from Louisville, Kentucky, last week reports that anti-evolutionists have recently won their contests against the teaching of evolution in public schools and colleges in three southern states and in a fourth are preparing for another encounter after having lost their first skirmish.

An anti-evolution law in Mississippi has been passed by the House of Representatives after a stormy session, and now goes to the Senate for action. Practically all the members of the upper house of the Mississippi Legislature heard the heated debates, during which an amendment was offered to make the penalty for teaching evolution "death by burning at the stake, it being the spirit of this bill to restore the Spanish inquisition."

The Text-book Commission of Texas, with Governor "Ma" Ferguson at its head, has made certain that theories of evolution would not be taught in the state-supported schools and colleges by deleting all references to theories of evolution from the text-books. Among the statements eliminated were:

All forms are related by descent from common ancestors.

Mutations give life a new species.

Evolution is a slow and gradual process.

Although a bill to prohibit the teaching of evolution in the schools of Georgia was lost at the 1924 session of the Legislature, the Atlanta Board of Education last week adopted a resolution to prohibit the teaching of evolution in the public schools there. A committee was appointed to investigate the charge "that the theory of evolution is being promulgated in the schools of Atlanta." The committee also has the power to enforce the new ruling.

Of the two bills now before the Kentucky House of Representatives, one was introduced by Representative Grover Cleveland Johnson, author of the first measure modeled after the Tennessee statute, which was lost two weeks ago on an adverse committee report. Representative Johnson's new measure is to prevent "atheistic teaching" in public schools and colleges. The other measure, less drastic than the Tennessee law, would prohibit teaching of evolution theories, but carries no penalty, other than cancellation of teaching contract.

THE EDUCATIONAL RESEARCH ASSOCIATION

We have received the final program for the meeting beginning Monday afternoon, February 22, in the Masonic Temple, Washington. The first topic on the program will be "An Experiment in Classroom Instruction by Radio," by Virgil E. Dickson, of the Berkeley, California, schools. Other speakers on the program are John G. Fowlkes, of the University of Wisconsin, who will talk on "Some Needs and Possibilities for Improved Efficiency in High-school Administration"; Arthur I. Gates, Teachers College, Columbia University, to speak on "Theories of Learning Tested by the Achievements of Deaf Children." Guy M. Whipple, of Danvers, Mass., will give a talk on "Measuring Musicians; A New Method of Analyzing the Style of Eminent Players" and will illustrate his talk by lantern slides and musical selections. "A Study of Pupil Failures and Subject Failures in the Chicago Public Schools" will be given by Don C. Rogers, of the Chicago schools. Harold O. Rugg, of Teachers College, Columbia University, will speak on "Intellect of Races: Is there a Nordic Myth?"

There will be a banquet and business meeting for members only at 6:00 P. M., Monday, February 22, in the Gold Room, Hotel LaFayette.

On Tuesday afternoon, February 23, in the Masonic Temple, the final session of the research association will be held. Among topics to be discussed at this meeting are: Functions of Certain Social Factors upon Success in School; Intelligence Ratings and Later Progress in High School and College; Intelligence and Personality as Factors in College Success; How Many Words should Pupils be taught to Spell?; Results of Homogeneous Classification of Junior High School Pupils; Examination Questions in History; and A Scientifically Graded Booklist for Children. Speakers on the program are S. A. Courtis, of the Detroit schools; F. P. O'Brien, of the University of Kansas; W. Hardin Hughes, of the Pasadena, California, schools; Ernest Horn, of the State University of Iowa; E. E. Keener, Chicago public schools; W. J. Osborn, Wisconsin state department of public instruction, and Carleton W. Washburne, superintendent of schools of Winnetka, Illinois.

The officers of the Educational Research Association are: President, M. R. Trabue, bureau of educational research, University of North Carolina, Chapel Hill; Secretary-treasurer, H. A. Greene, bureau of educational research and service, State University of Iowa, Iowa City, Iowa.

THE NATIONAL ASSOCIATION OF HIGH-SCHOOL INSPECTORS

ACCORDING to the final program, the first meeting will be held on Monday afternoon, February 22, in the committee room of the National Hotel, when examinations and tests will be discussed. Avery W. Skinner, of the New York State Department of Education, will give a report of an extensive study. The following topics will be considered for discussion: The types of examinations which have been found to be worth while as educational instruments and as aids in determining fitness for promotion within a school system. To what extent are intelligence tests and achievement tests used? Examinations as a means of determining fitness for college work.

What Steps ought to be taken to provide High School Facilities for those living in Rural Communities will be discussed by J. S. Stewart, of the University of Georgia, at the second meeting of the association, to be held in the committee room of the National Hotel on Tuesday morning, February 23. Samuel M. North, of the Maryland State Department of Education, and J. T. Giles, of Wisconsin, will discuss How can the High-school Inspectors and Supervisors influence Teaching Methods?

At the third and final session on Tuesday afternoon, February 23, in the National Hotel, The Honor System will be discussed by E. E. Brown, Oklahoma high-school inspector, and there will be a report on the Status of the Commercial Courses in the Small High Schools. There will be a business meeting and general discussion at the conclusion of this meeting.

Officers of the National Association of High-school Inspectors and Supervisors are: *President*, Thomas Lloyd-Jones, University of Wisconsin, Madison, Wis., and *secretary*, J. S. Stewart, professor of secondary education, University of Georgia, Athens, Ga.

EDUCATIONAL NOTES AND NEWS

REGISTRATION at the Washington Auditorium for what promises to be the largest and most important meeting ever held by the Department of Superintendence of the National Education Association opened on Friday, February 19. President Coolidge will address the members on the evening of Washington's birthday. Other public men who will speak during the meetings are: Secretary of Commerce Hoover; ex-Governor Lowden, of Illinois; Commander Donald B. McMillan, the explorer, and Representatives Hall, of Indiana, and Beedy, of Maine. Addresses will be made by Mary McSkimmon, president of the National Education Association; Dr. Frank W. Ballou, president of the Department of Superintendence, and leaders in education from all parts of the country. SCHOOL AND SOCIETY will publish in subsequent issues full reports of the meetings and some of the more important addresses and papers.

THE home-coming day of the Alumni Association of Teachers College on February 19 was in honor of Professor Edward L. Thorndike and to celebrate the twenty-fifth anniversary of his professorship at the college. In the afternoon Professor Thorndike made an address on "The Psychology of Adult Learning" and there were addresses by Professor Charles H. Judd, director of the school of education of the University of Chicago, and Dr. Agnes Rogers, professor of education at Bryn Mawr College. On the evening of February 19, a dinner was given in honor of Professor Thorndike. Speeches were made by Dean James R. Russell, Dr. Frederick P. Keppel, Dr. J. McKeen Cattell, President Henry Suzzallo, President Lotus D. Coffman, Professor R. S. Woodworth, and Professor Mary T. Whitley. Professor Eugene F. Smith presided. The number of the *Teachers' College Record* for February is published in honor of Professor Thorndike. It contains many tributes from his colleagues and former students and includes an annotated bibliography of his publications.

A DINNER in honor of Dr. Graham Lusk, professor of physiology in the Cornell Medical School, was held in New York on February 15, his sixtieth birthday. Professor Frederic S. Lee, of Columbia University, presided, and the speakers included Professor William H. Howell, of the Johns Hopkins University, and Professor A. B. Macallum, of McGill University. A volume was presented to Dr. Lusk containing photographs and letters from one hundred and eighty of his fellow-workers.

PROFESSOR WILLIAM P. MASON, who has retired after fifty years of teaching chemistry at

the Rensselaer Polytechnic Institute, was guest of honor at a testimonial dinner given by alumni of the institute at the Hotel Biltmore, New York City, on February 6.

A TESTIMONIAL banquet was recently given to Miss Frances G. Curtis and Dr. David D. Scannell, retiring members of the school committee of Boston by the four organizations of Boston School Principals. Dr. Jeremiah E. Burke, who was associate superintendent and superintendent of the city schools for many years, made the principal address.

A RESOLUTION of appreciation for the service of E. R. Whitney, who recently resigned as superintendent of schools in Schenectady, N. Y., because of ill health, was adopted by the Associated Academic Principals at the recent meeting in Syracuse. Superintendent Whitney had served the association as president and as a member of the legislative committee. The resolution of appreciation reads in part as follows: "We wish him to know of our high regard for him as an educator, an untiring worker, a wise counsellor, a faithful friend and a true gentleman, and we offer this resolution of appreciation for the splendid service which he has so willingly rendered our organization. We wish him well in the years to come."

DR. ALBERT DAVIS MEAD, director of the department of biology at Brown University, has been appointed vice-president of the university.

THE REVEREND DR. J. STANLEY DURKEE, president of Howard University, Washington, D. C., has received a call to fill the Plymouth Congregational Church, of Brooklyn, N. Y.

DR. JAMES H. TUFTS, of the University of Chicago, wishes it to be understood that he has not retired or resigned his chair in philosophy. He has relinquished his administrative position only and will return to full-time work as professor.

PRESIDENT STRATTON D. BROOKS has taken up his work at the University of Missouri after a severe attack of influenza. He became ill at the meeting which the St. Louis Alumni Association gave in his honor on December 11.

SUPERINTENDENT IRA B. FEE, of the Missoula public schools, is president of the Montana Education Association for 1926.

GEORGE R. RAYNOR, principal of the Chautauqua High School, was elected president of the Associated Academic Principals of the State of New York at the annual meeting of the association which was held in Syracuse on December 28, 29 and 30. Other officers elected at the meeting are: *Vice-president,* George L. Bennett, principal of the Charles E. Gorton High School of Yonkers; *secretary,* Lyndon H. Strough, principal of the Fulton High School; *treasurer,* Walter S. Fraser, principal of the Niagara Falls High School; *executive committee,* B. E. Whittaker, principal of the Oyster Bay High School, *chairman;* M. Smith Thomas, principal of the Hutchinson-Central High School, Buffalo; Charles E. Riley, principal of the Oswego High School.

SUPERINTENDENT H. B. WILSON, for eight years head of the public schools of Berkeley, Calif., has been reelected superintendent of schools for a term of four years at a salary of $8,000 a year by the unanimous vote of the board of education.

SUPERINTENDENT FRANK H. BEEDE, who has served for twenty-five years in New Haven, Conn., has been reelected for a period of five years at a salary of $8,250.

AT a recent meeting of the board of education of Hastings, Nebraska, Superintendent A. H. Staley was reelected for a three-year term at $4,750. The Hastings schools are planning a building program calling for an expenditure of $450,000.

MISS ELLA V. DOBBS, associate professor of industrial arts at the University of Missouri, past president of the Missouri State Teachers Association, has been appointed state supervisor of arts, and James T. Sleeper, of the School of Fine Arts, has been appointed a state supervisor of public school music.

L. R. HUMPHREYS has been appointed state supervisor of high-school agricultural education in Utah, succeeding Mr. I. B. Ball.

MR. HARTMAN, of the Carnegie Institute of Technology, has resigned to become director of education for the United Typothetae of America.

PROFESSOR WILL S. TAYLOR, of Brooklyn, who has been instructor in art at Pratt Institute for the past ten years, has been appointed

professor of art at Brown University, beginning with the September term. He will also be curator of the Brown art collection.

PROFESSOR FRANK L. MARTIN has been appointed acting dean of the school of journalism of the University of Missouri, in the absence of Dean Walter Williams in an exchange of professors with the University of Mexico.

DR. RAYMOND A. PEARSON, who was recently elected to the presidency of the University of Maryland, plans to spend in Europe the intervening months before taking up his new work in the autumn.

DR. WILLIAM C. BAGLEY, who has spent the past six months in studying educational institutions in Europe, has returned to the United States and has resumed his work at Teachers College.

DR. CHARLES H. HANDSCHIN, of Miami University, has been engaged to give three courses in German at the coming session of West Virginia University.

ISAAC JOSLIN COX, professor of history at Northwestern University, sailed from New Orleans on February 17 for Santiago, Chile, to make an extensive study of the government of Chile for the Carnegie Institution of Washington. During his several months' stay he will deliver a course of lectures at the University of Chile on the history of the United States.

LECTURERS on the faculty of the summer quarter of Stanford University include Professor Jean-Marie Carré, of the University of Lyons, Romantic languages; Dr. Alfred Pribram, of the University of Vienna, history, and Dr. Moritz Geiger, of the University of Göttingen, Germany, philosophy.

MISS ELIZABETH CONRAD, dean of women at the Ohio State University for more than six years, resigned in December. The trustees by unanimous vote accepted the resignation, effective June 30, 1926, and she was given a leave of absence on salary for the winter and spring quarters, 1925–26, because of services rendered in teaching during previous summer quarters. *The Ohio State University Monthly* states that "prior to this official action of the board Miss Conrad was advised privately that her contract would not be renewed at its expiration in June—though no formal request was made for her resignation. From various statements attributed to Miss Conrad in the newspapers, it is apparent that the dean and the board were not in accord as to certain administrative policies and attitudes of her department in undergraduate women's affairs—especially in the field of student discipline."

THE annual dinner of the School of Education of New York University will be held in connection with the meeting of the Department of Superintendence of the National Education Association at Washington on February 24. The speakers will be: Dr. Elmer Ellsworth Brown, The Honorable John J. Tigert, Dr. S. A. Courtis, Miss Mary McSkimmon, The Honorable Payson Smith, Dr. John W. Withers and Dr. Ambrose L. Suhrie. Dr. Ralph E. Pickett, School of Education, New York University, Washington Square East, New York City, is treasurer of the dinner committee.

A SURVEY made at the request of the State Board of Education of the public schools of Utah will be under the direct supervision of the Commissioner of Education, Dr. John J. Tigert, who has now returned from Utah where he made a preliminary investigation of school conditions in that state. The following educators will assist in the survey: Dr. Chas. H. Judd, director of the School of Education of the University of Chicago; Dr. George A. Works, professor of rural education, Cornell University; Dr. Jesse B. Sears, professor of education, Leland Stanford University, California, general consulting advisers; Dr. Fletcher Harper Swift, professor of education, University of California, problems of school financing and school support; Dr. Julian E. Butterworth, professor of rural education, Cornell University, school buildings. These, with at least ten specialists selected from the regular staff of the Bureau of Education, will constitute the complete survey staff. The field studies will be made during the latter part of March and the first half of April.

THE New York commissioner of education, Dr. Frank P. Graves, gave an address on January 15 at the mid-year educational conference of the Michigan State Teachers College at Ypsilanti, on "The Function of Leadership."

On January 17 he addressed the Men's Forum of Binghamton on "Outstanding Tendencies in Present-Day Education," and spoke at the meeting of the Ministerial Association in Albany on January 18 on "The Use and Abuse of Intelligence Testing."

DR. GEORGE EDWIN MACLEAN, formerly president of the State University of Iowa and at present associated in the work of the American Council on Education, and one of the governors of the Washington branch of the English Speaking Union, was the speaker at the opening exercises of the second semester of the College of Liberal Arts, American University, Washington.

DR. SCOTT NEARING gave an address before the Harvard Liberal Club on February 11 on conditions in Russia, from which he has recently returned.

DR. C. E. BENSON, professor of educational psychology in the school of education of New York University, gave a talk on "What Psychology can and can not do for us" before the North Hudson Schoolmasters' Club of Union City, New Jersey, on January 30.

ON January 21 Dr. Arthur Mays, of the University of Illinois, addressed the Educational Committee of the Woman's City Club of Chicago on "Education in Democracy." He discussed the efforts of continuation schools to educate the boy or girl who could not adjust himself or herself to orthodox school work and who had sought employment.

DR. EDITH MULHALL ACHILLES, supervisor of the courses in psychology of the home study department of Columbia University, addressed the Parents Association of the Oxford School in Hartford, Conn., on February 10 on "Mental Measurements: the History of their Development and their Use."

PROFESSOR ANNA Y. REED, of the school of education of New York University and managing director of the National Junior Personnel Service, addressed the annual meeting of the Associated Industries of Oklahoma on February 10, at Tulsa, Oklahoma. Her topic was "Measuring the Results of Restrictive Legislation." She also spoke, on February 8, before the Wednesday Club of St. Louis; on February 12 she addressed the general session of the Oklahoma State Teachers Association at Oklahoma City, and on February 15 she spoke to the Women's Chamber of Commerce of Kansas City, Missouri.

SIR ARTHUR CURRIE, principal of McGill University, Montreal, spoke on Lincoln on February 12 before the League for Political Education, New York. Dr. John H. Finley presided at the meeting.

DR. WILLIAM H. DEVINE, former director of school hygiene for the schools of Boston, died on February 5.

THE fourth National Motion Picture Conference was held at the Congress Hotel, Chicago, February 10 to 12. President Max Mason, of the University of Chicago, gave the welcoming address and the program included papers by Dr. L. L. Thurstone, of the department of psychology at Chicago, and Professor E. A. Ross, of the department of sociology at the University of Wisconsin.

NEAR East Relief and its relations to the public schools of America will be discussed at a conference at the Powhatan Hotel, Washington, on February 24. Senator King will preside.

IMPRESSIVE ceremonies marked the dedication on February 6 of the first unit of the University of Iowa memorial union at Iowa City, built at a cost of $1,000,000. Governor John W. Hammill accepted the union in behalf of the state and presented it to the university, represented by Allin Dakin and Mary Goodykoontz, presidents of the senior honorary men's and women's societies. The first of the three units, a brick structure, has been erected at a cost of $200,000 and will be used mainly as a social center, with its large ballroom, 90 by 130 feet, to be used for the university parties and other social events. Funds for the union were raised by students, alumni and friends.

A GIFT of $50,000 to Yale University has been made by Mr. and Mrs. James Fenimore-Cooper, of Albany, N. Y., in memory of their son, James Fenimore-Cooper, Jr., B.A., Yale, 1913. The fund will be known as The Captain James Fenimore-Cooper, Jr., Scholarship Fund. This fund is to be increased so that ultimately

scholarships of approximately $1,000 each, which will be the largest undergraduate scholarships yet provided by any fund at Yale, may be awarded to worthy and deserving students who need financial assistance to pursue their courses. According to the terms of the gift awards will be made to students whose scholarship standing shall be satisfactory to the university but who shall be chosen primarily because of their character, capacity for leadership among their fellows and promise of future usefulness. Preference will be given to students from Cooperstown, Otsego and Albany, New York.

THE will of the late D. H. Fanning, of Worcester, Mass., founder of the Royal Worcester Corset Company, included the following bequests to educational institutions: Mount Holyoke College, $5,000; Connecticut College for Women at New London, $25,000; Talladega College in Alabama, for a new dormitory, $25,000; Perkins Institute for the Blind in Watertown, $5,000; Moody's School for Girls at Northfield, Moody's School for Boys at Northfield, $5,000 each; Berea College in Kentucky, $3,000. Any further residue remaining is given equally to Worcester Institute of Technology, the Connecticut College for Women, Talladega College and Hahnemann Hospital.

BY the will of Joseph Oliver Stokes, president of the Thermold Rubber Company, one million dollars is left to the city of Trenton, N. J., for the erection of a public school. The bequest is made in memory of the only son of Mr. Stokes, who died in 1905, at the age of twenty years, shortly after he had entered Princeton University.

THE school committee of Malden, Mass., has submitted to the mayor a budget for 1926 which recommends salary increases as follows: Elementary teachers, $50 to $1,600; junior high, $100 to $1,700; senior high (women), $100 to $1,900; senior high (men), $100 to $2,600. This applies only to those receiving the present maximum and the increases would become effective on September 1. The committee would also like to establish a new maximum for teachers, effective by September 1, 1927, giving the elementary teachers $1,650; junior high $1,800; women in the senior high $2,000, and men in the senior high $2,700.

OF 52,217 pupils examined last year in the public schools of Washington, D. C., 43.1 per cent. were found with defective vision in one or both eyes, according to a report to the Eye Sight Conservation Council of America, by Dr. Joseph A. Murphy, chief medical and sanitary inspector of public schools. Only 29,686, or 56.9 per cent., had normal vision in both eyes. "In this latter group," says the council's statement of Dr. Murphy's findings, "5,932, or 11.3 per cent., had normal vision in one eye only—the other eye was defective; 15,531, or 29.7 per cent., had defective vision of varying degrees in both eyes, ranging from eight tenths to four tenths of normal, and 1,068, or 2.04 per cent., were seriously handicapped with defective vision in both eyes less than four tenths normal." The work of the Washington authorities, carried on under the direction of the city health department, is praised by the council as a notable example of constructive action in eye conservation, which, it is asserted, is a national need both in education and industry.

THE William Penn Charter School of Philadelphia, which is in its 236th year, has taken possession of its new buildings at Pinehurst, Germantown, on a tract of 22 acres. For fifty years the school was situated at 8 South Twelfth Street, in the heart of Philadelphia. The new plant is regarded as one of the finest of any secondary school in the country. The buildings are of native stone, with a tower suggesting Independence Hall and architecture throughout of the Colonial period. At present the main building is completed and the physical and chemical laboratories and the gymnasium are to be occupied in the near future. The enrollment at Penn Charter this year is 603 boys, the largest in the history of the school.

THE *Journal* of the American Medical Association reports that arrangements have been completed to introduce into the normal schools of Illinois compulsory courses in health education. The plan agreed on by the presidents of the five universities, the state department of health and the state department of registration and education requires that each student have a certificate of health signed by the family physician and undergo a physical examination within a year of registration and again within a year of graduation. The courses in health education for two-year students will consist of five hours a week in the classroom, supplemented by field

work such as sanitary investigations and by work in the gymnasium; four-year students will take, in addition, one of a group of elective health subjects. The object is to give the future public school teachers a practical training in hygiene and sanitation that will enable them to teach health in the schools.

DISCUSSION

HISTORY OF MATHEMATICS IN THE SCHOOLS

To prove a theorem usually involves less than one tenth as much energy and thought as is necessary to secure a satisfactory insight into its history. Hence the student has to choose between an insight into the historical development of a comparatively small number of mathematical facts and the intellectual penetration of a much larger body of mathematical truths. Scattered historical notes, such as appear in many of the modern text-books, are very useful even if there is insufficient time to master their full significance. In fact, it would be unwise to devote much attention to such notes in a course for undergraduates, but their presence tends to remind the student that mathematics has an important place in the history of civilization and that the abstractions with which he is dealing represent human achievements extending over a long period of time.

A question on which teachers of mathematics hold widely different views is whether a special course in the history of mathematics should appear in the usual mathematical curriculum, and at what time in the student's career such a course should be given. The recent appearance of two extensive American works which aim to serve as text-books for such a course tend to direct special attention to this old question at the present time as well as to the great difficulties involved in a judicious answer thereto. Even those who read these works only superficially are naturally impressed by the vastness of the history of their subject and the relatively meager amount of desirable information relating thereto that can be presented in one or two volumes. Moreover, it is too much to expect to find teachers who are in position to supply readily the additional desirable information in view of the many discordant views found in the literature as regards historical questions.

It is well known that the late G. Eneström, who was one of the most noted mathematical historians of his day, expressed the opinion[1] that it was undesirable to introduce many historical notes into the mathematical text-books used in the gymnasiums of Sweden in view of the fact that their teachers were not sufficiently trained along historical lines to be able to verify these notes as regards accuracy. A very much wider range of historical information is needed by those who offer special courses in the history of mathematics, and it seems very questionable whether a sufficient number of properly equipped teachers could be found in our country to teach effectively as many courses along this line as are now being offered.

In some of the older countries interest in the history of mathematics in the schools is increased by the fact that national appreciation can be fostered thereby, since many important contributions were made by their own countrymen. In America there is comparatively little opportunity along this line, since American contributions relate mainly to the more advanced fields of mathematics. This is, however, not a very important point, since it is desirable to impress the student early with the cosmopolitan spirit in scientific work. It is, however, true that the position of the history of mathematics in a mathematical curriculum presents difficulties which are far from being definitely solved at the present time. Both those who favor an emphasis on the historical phase of this subject and those who oppose such an emphasis can find strong arguments in support of their views.

If the term "teaching a subject" would imply merely the drilling of students on what a certain text-book contains in reference thereto no other mathematical subject would be easier to teach than the history thereof. On the other hand, if the teacher is supposed to be an authority on what he presents to his student and on the questions which naturally arise with reference to the elucidation of the questions under consideration this history involves greater difficulties than any other subject in the ordinary

[1] "Bibliotheca Mathematica," Vol. 14 (1913), p. 7.

curriculum. Hence the difficulty of finding suitable teachers for special courses in the history of mathematics naturally increases with the advancement of our standards as regards teachers. Just as the late Felix Klein studied pure mathematics with a view to laying a broad foundation for physics but never really reached the latter subject so many a student of mathematics who is deeply interested in its history never feels that he has reached the point where he understands the subject sufficiently well to study its history with real success.

G. A. MILLER

UNIVERSITY OF ILLINOIS

HUMANITIES—LATIN OR ENGLISH?

IN the issue of *Science* for October 23, Professor Sears inquires, "Is it not possible that the drive against the humanities has been too successful?" As there exists a good deal of nescience regarding the present standing of this drive, perhaps the following statements from the Classical Investigation[1] (part 1. pp. 16, 17) may be of interest.

> The total enrolment in Latin in the secondary schools of the country for the year 1923–1924 is estimated by the United States Bureau of Education at 940,000, slightly in excess of the combined enrolment in all other foreign languages. It is approximately 27.5 per cent. of the total enrolment of all pupils in all secondary schools. . . . There are approximately 22,500 teachers of Latin in the secondary schools of the country. . . . The Latin enrolment in the colleges of the country in 1923–1924 was approximately 40,000.

These figures as regards schools do not seem to include the enormous mass of Catholic children taught in parochial or other church schools, every one of whom has to acquire an elementary knowledge of Latin, at least. If we take 14,000,000 as the probable population of the Roman Empire at the time of Augustus, it is certain that right here and now very many more children are studying Latin than ever studied in imperial Rome at the height of her grandeur.

If any one wants more facts on this matter, let him turn to the proceedings of the Classical League at the N. E. A. convention a few months ago. These proceedings were simply a hymn of triumph. So far from there being any drive against the humanities at present, the situation (if humanities means Latin language and Augustan literature) is just the other way. The classicists are victorious all along the line. "The number of Latin pupils is enormous," exults Dean West, of Princeton, in his presidential remarks to the league. He continues: "The strategic center of our campaign is not now in the universities, important as they are, but in the secondary schools."

Those of us who have undergone the Latin discipline and acquired a good reading command of the language know very well from experience that its six or eight usual authors have no great humanistic value, and that they are useless as helps to scientific training or thinking, unless, as in a few instances (such as Cicero's "De Divinatione," or the pseudo-Tacitus' "De Oratoribus") the text itself, apart from the language, be pregnant with thought. *Let us have humanities by all means, but, why, in the name of common sense, should they not be the glorious and immense English literature and the English language?* As to the further attempt to inculcate the "spirit" of the Latin classics—the spirit of political humility in a lordly state—it would be hard to find ideas and ideals more opposed to those which have descended to the northern peoples or, as far as that matter goes, which are to be found in the laws and literature of Ireland, as far as the present writer knows? (In these remarks I do not consider Greek literature at all, for the very good reason that while nearly one full million children in the secondary schools study Latin, only eleven thousand study Greek; and, of this eleven thousand only three thousand are in the public schools, against 815,000 in the public schools who take Latin. For the present discussion, Greek is obviously irrelevant.)

It might be supposed that the present writer would agree that the botanic "manipulators" mentioned in Professor Sears's communication, did indeed need a course in the humanities even though instead of the ancient humanities they imbibed the thoughts of the English Elizabethan dramatists or the English anthology. My acquaintance among botanists is almost nil, but

[1] Princeton University Press, part 1, September, 1924; part 3, July, 1925; part 2 not yet published.

among engineers of all sorts as well as among chemists it is larger. The young gentlemen referred to have probably mischosen their vocations. Instead of scientific studies involving "hand work" as the "fascinating" part of the work, would not positions as chauffeurs, assistants to chefs, telephone wire stringers, etc., be the better part of life to these youths? An extension of intelligence tests in the near future may probably settle this and similar questions.

It might be well to add that, in his address, Dean West says: "We are not fighting for the success of Latin and Greek, but for the success of a really liberal education and for all studies, natural, scientific, literary or historical which best serve this great end." As the whole campaign and the league itself which he heads is directed towards the definite supremacy of ancient humanities, this sentence (which I give, not to seem unfair) appears incongruous with its context and with the situation wherein it appears.

DREW BOND

MT. VERNON, N. Y.

QUOTATIONS

THE PROBLEM OF THE COLLEGE STUDENT

IN our colleges, the country over, critics have complained at the lack of mental endeavor and at the alleged frivolity of the average undergraduate interests. It must be admitted that American students are sometimes guilty of a pose, said to be imported, which assumes that they never give attention to study. Doubtless it is true that a brilliant student may maintain himself with relatively small expenditure of effort, for we still labor in too large degree under the lockstep system which makes substantially the same demand on the bright boy as upon his less able neighbor. The pace is set for boys of not more than average ability.

Whether through a reversion to the old method of "sectioning" on the basis of ability, through individual attention, or through whatever other means, we must bring it about that the varying abilities of men are given fuller recognition so that we may call out the best endeavors of each.

The breadth and seriousness of interest at Yale in literature, art and the drama is certainly refreshing and quite beyond question. Nor is there wanting a ready response to religious and philanthropic appeal, especially when this carries with it the flavor of adventure, as do the Grenfell Mission expeditions and the opportunities to teach at Yale in China.

If there is a dull area, it is perhaps in the field of political and social thought and action. A few ardent souls are always stirred by the unrighteousness of industrial, social, or political conditions, and voices proclaiming the gospel of religious and moral reform are always to be heard in the academic wilderness. But, in general, the undergraduate is ill informed about political affairs, and notably indifferent to them, except in the presence of an election.

To those who believe that college should afford an atmosphere of cloistered detachment, this is perhaps no matter for regret, provided the opportunity for scholarly reflection is improved. Unhappily, we know that under current conditions such reflection is rare, and that student life is geared up to a restless and incessant round of occupations, some worth while, others not.

To save the student from the consequences of his own ingenuity, reflected in the innumerable collegiate organizations, seems now no small part of our obligation. The easy solution would be the imposition of tasks which would completely fill the time of the student with hard work. But the American college has rightly felt that a measure of leisure is an indispensable element in a liberal education, and it must therefore accept the consequences of the possible misuse of such leisure.

For half a century and more American educators have been disturbed that the American boy lags a year or two behind his British and Continental cousin in his educational progress, and particularly that at the end of it he so often presents a distinctly inferior intellectual result. This retardation inheres in the whole educational system from top to bottom, and is not to be cured by remedies applied merely at one point. The trouble is compounded of many factors: too little acquaintance with really hard work, too long and possibly too many vacations devoid of study, poorly organized programs of study, and so on.

Fortunately the problem is being attacked, and it may already be said to have been demonstrated that at least two years can be squeezed out of the present procedure and still have a normal youth of nineteen better trained and more genuinely educated than is his brother today at twenty-one.

It will be no easy matter to persuade the average parent of the advantage of a system which will get his boy into college two years earlier than at present. Too many of the rewards of college life, of which both parents and students are avid, place a premium on physical and social maturity.

Many institutions, Yale among them, are making efforts to offset the defects of the present system by stimulating intellectual independence, and by recognizing maturity of mind. At the college level it is too late to save the student the years he has lost, but at least we can make the attempt to furnish a less flabby training than heretofore. We can do it partly by stiffening the intellectual requirements, and partly by stimulating the student to a more fundamental use of his intelligence; and it is to this end that our tutorial systems, our comprehensive examinations, our honors courses, and the like are directed. Although all these are rather frank adaptations of English university procedure, we can hardly allow our patriotic sentiments to interfere with the effort to employ them so far as they are assimilable to American conditions. They have in them the beginnings of the true university spirit, and will expedite the integration of collegiate with university ideals. Yale is very eager to play her part in this entire movement.—*From the Annual Report of President Angell, of Yale University.*

REPORTS

THE PRESENT STATUS OF VOCATIONAL GUIDANCE IN GERMANY

A RECENT survey by Dr. Stets, of the German Federal Ministry of Labor, the results of which are published in the September, 1925, issue of *Reichsarbeitsblatt*, among other data gives the following:

The work of securing closer cooperation between employment exchanges and the vocational guidance offices, as provided for in the legislation of July 22, 1922,[1] has continued until at the present time it is almost the general rule that the employment exchanges and the vocational guidance offices are amalgamated and functioning as one service.

The number of whole-time vocational advisers for boys in these offices is now one hundred fifty-six, nearly double the number in 1922. The number of whole-time advisers in these offices for girls is eighty-two.

The number of boys and girls applying for advice on the choice of a vocation during the year 1923–1924 was 256,660, an increase of more than 20,000 over the preceding year. The proportion of boys and girls applying for advice during the same period was: Boys 57.5 per cent., girls 42.5 per cent.

The percentages of boys and girls coming from the elementary and from the secondary schools were as follows:

	Boys	Girls
Elementary Schools	91.5	91.0
Secondary Schools	8.5	9.0

The number of vacancies for apprentices registered at these offices during 1923–1924 totaled 134,040, of which 88,643 were for boys and 45,397 for girls.

Of all young persons asking advice, only 41.7 per cent. were placed. Of the total vacancies filled, 92.3 per cent. were for apprentices.

Positions as motor and bicycle mechanics were the most popular among boys, and dressmaking and commercial work most popular among girls.

The report closes with a statement of feeling that the present method of guidance and placement is organized on a sound basis, is making good progress and is a decided advance over the admittedly superficial work and growth of earlier years.

It is the opinion of the present writer that it will be decidedly worth while for the students and advocates of the guidance movement to follow as closely as possible the legislation, methods of organization and the technique as they develop in other countries, particularly in Germany and New Zealand. So far as the

[1] *Reichsgesetzblatt*, Teil 1, No. 56, p. 657.

present writer is aware, these two countries have the best basic and most effective guidance legislation of any countries.

It is interesting to note that Scotland, where the guidance movement had its birth, under Mrs. Ogilvie Gordon (1904), has no effective legislation for guidance. England passed its "choice of employment act" in 1910, which is functioning as guidance in a desultory sort of fashion, but more effectively as job-getting. New Zealand passed its apprentice act, August 29, 1923. In the development of the New Zealand legislation the educator has been largely ignored, the control being vested in the Department of Labor, but it is required of the school principal that he shall furnish the guidance agency with a complete statement of the mental qualities of the boy or girl. This, of course, places the real burden of examination and diagnosis on the school man.

Guidance in Germany had its beginnings with the work of Dr. Wolff, of Halle, who, as director of the Bureau of Labor Statistics, developed a keen sense of the inadequacy of attempting to effectively place people, young or old, in positions while knowing practically nothing about the individual and very little about the requirements of the job. In 1908 Dr. Wolff opened the bureau evenings, made an elementary study of the individual, gave advice, placed them in positions and best of all "followed-up" these people to check the results of his diagnosis and advice.

It is interesting to note how the various types of legislation emphasizes one phase of a complete guidance system and ignores another. At the present time in most legislation the emphasis is on placement, the idea apparently being that a guidance agency is a kind of sublimated employment agency. While it is true that placement is one of the functions of a complete guidance system, it must be kept clearly in mind that three very important steps must precede placement. These steps are: (1) A thorough analysis of the individual; (2) an analysis of the job and the drafting of job specifications; (3) education and training to meet the requirements of the job as set up in the job specifications; (4) then comes placement, which should be followed by (5) a systematic follow-up system and study of the effectiveness of the individual on the job so as to check the accuracy and effectiveness of the preceding steps.

ARTHUR FRANK PAYNE

NEW YORK, N. Y.

SOCIETIES AND MEETINGS

THE HEADMASTERS' ASSOCIATION

PRACTICALLY all the 100 members of the Headmasters' Association attended the thirty-fourth annual meeting of the association, held February 12 and 13 at the Hotel Pennsylvania, Philadelphia. The program included four sessions, the annual dinner and two sight-seeing trips in and about historic Philadelphia. On February 12 the headmasters visited Bryn Mawr College and had luncheon at Haverford College as guests of President Comfort; on February 13 they were guests of the University of Pennsylvania for luncheon, and President and Mrs. Aydelotte had tea that afternoon for a group of members.

The business sessions were in charge of the president of the association, Harry A. Peters, of the University School, Cleveland, O., and of the secretary, N. Horton Batchelder, of Loomis Institute, Windsor, Conn. "Development of initiative, responsibility and self-reliance" was the topic of the afternoon session of February 12, at which the speakers were Joseph D. Allen, of the Polytechnic Preparatory Country Day School, Brooklyn, N. Y.; Dr. Otis W. Caldwell, of the Lincoln School, New York; Walter D. Hood, of Gilbert School, Winsted, Conn.; Islay F. McCormick, of Albany Academy, Albany, N. Y., and Frederick Winsor, of Middlesex School, Concord, Mass.

At the evening session of February 12, Stanley R. Yarnall, of the Friends School, Germantown, Pa., gave an address on "Abraham Lincoln." There were talks by President W. W. Comfort, of Haverford College, on suggestions for educational improvement; by President Frank Aydelotte, of Swarthmore College, on honors courses in American colleges, and by Vice-Provost George Wm. Clelland, of the University of Pennsylvania.

Professor Rufus M. Jones, of Haverford, spoke on "Moral and Religious Training" at the morning session of February 13, followed

by discussion by Adrian H. Onderdonk, of St. James School, Washington County, Md., and Edwin M. Wilson, of the Haverford School.

In the absence of Dean Weathers, a paper was read on the afternoon of February 13 by Professor Philip W. Cox, of the School of Education, New York University, on "How Much and What Training for the Young Secondary School Teacher?" Short talks on the same topic were given by Herbert W. Dutch, of the Montclair, N. J., High School; Richard M. Gummere, of the William Penn Charter School, Philadelphia, and W. E. Stearns, of the Barringer High School, Newark, N. J.

A year ago President Peters pointed out the unsatisfactory connotation of the term private school and urged that headmasters seek something more appealing and more representative of the character of the endowed secondary school of to-day. At the afternoon session of February 13, Francis S. Hackett, of the Riverdale Country Day School, New York, referred to the suggestion of President Peters and told how a group of headmasters decided to use the term independent school as a fitting substitute for private school. He advocated wide employment of the new word, independent. No formal action was taken, but the proposal appeared to win favor.

The extent to which the new law makes the consular service an attractive field for school and college men was described by the Hon. Roland S. Morris, former ambassador to Japan, in an address at the annual dinner of the association. Other speakers were Britton Hadden, editor of *Time;* Wilson Farrand, of the Newark Academy, Newark, N. J., and President-elect Clement C. Hyde.

Officers for the year were elected as follows: *President,* Clement C. Hyde, of the Hartford, Conn., Public High School; *vice-president,* Walter B. Gage, of the Hackley School, Tarrytown, N. Y.; *secretary,* Stanley R. Yarnall, of the Germantown, Pa., Friends School; *treasurer,* Ralph E. Files, of the East Orange, N. J., High School; *executive committee members,* Morton Snyder, of the Scarborough School, Scarborough, N. Y.; George E. Quaile, of the Salisbury School, Salisbury, Conn., and N. Horton Batchelder, of the Loomis Institute, Windsor, Conn.

R. W.

EDUCATIONAL RESEARCH AND STATISTICS

DISTRIBUTION OF COLLEGE GRADES

THE problem of grading in schools and colleges is attracting increased attention from year to year. Its full importance does not yet seem to have been fully realized. Its relationship to scholarship standards and to the development of morale for high scholarship is a phase of the problem that has not been sufficiently emphasized. It is the purpose of the present article to give the results of an investigation made in the colleges of Alabama and to point out the salient advantages of a uniform grading system in colleges.

There is a wide difference of opinion on the part of college instructors as to the wisdom of standardizing the grading system. There is a prevailing belief that we are becoming too standardized in all phases of our life and that to tamper with the college teacher's opinion of his own standards in such a way as to control the ranking which he gives his students is wrong in principle. Many instructors feel that grades are merely a matter of objective achievement on the part of students and must be so considered. If this is true it is unjust and unwise to say that the teacher's distribution of grades should follow a standard such as the normal distribution curve. A teacher who holds this view feels that any investigation of his grades with a view to changing the frequencies with which certain grades occur is definitely meddling with his affairs and is, therefore, unwarranted.

On the contrary, it is very evident from the wide divergence in the proportion of high and low grades that the college which does not have some means of making its grading uniform is inconsistent and unfair in its rating of students. The evils are manifold. In the first place, there is the normal tendency to give too large a proportion of high grades and too low a proportion of low grades on the part of the careless teacher or the teacher who has not had very thorough training. On the other hand, a teacher coming into an institution fresh from graduate study, or the over-conscientious teacher who has high ideals of perfection in the subject is likely to give a very low proportion of high grades and a high proportion of low

grades. So called "snap" courses are found in most institutions and are the subject of common conversation among students. Likewise "hard" professors are discussed quite freely and avoided when possible by a large group of students. But these are not the most serious or fundamental evils resulting from unsystematic grading.

Through lack of uniformity of standards, the college becomes a house divided against itself. Its diverse standards negate each other and with this diversity the institution can not stand as a lighthouse pointing to high ideals of scholarship, for college rating, when there is too great diversity, becomes, to a large extent, meaningless.

The writer has sought during the past two years as dean of a small college[1] to work out a plan for making the grading uniform within the institution, and to assist in this matter he has made an investigation of grade distribution in the various colleges of the state. In table 1 given below, which has been prepared through the courtesy of the deans and registrars of the various colleges in the state, we have the analysis of the grading for the first quarter or semester of the session 1924-25. There are twelve institutions represented in the investigation; three of them are two-year state-supported normal schools (accredited junior colleges), three four-year state-supported colleges and six four-year denominational colleges.

Among the number are five institutions that belong to the Southern Association of Colleges and Secondary Schools. The total investigation covers 40,125 students' grades. The students are, practically without exception, graduates of the high schools of Alabama and are presumably more or less uniform in training and intelligence. In this table it will be noted that the grades in all subjects have been lumped together and the number of grades and percentages of each apply to the institution as a whole.

The percentage of A's ranges from 13 (in No. I) to 38 per cent. (in No. XII); the percentage of E's and F's combined ranges from 4.5 per cent. (in No. XII) to 30.4 per cent. (in No. IX). When we consider that these proportions are for the institutions as a whole and, therefore, cover a large enough number to be uniform, if the system of grading were uniform, we can see the wide diversity of standards set up by the colleges within a given state.

[1] Alabama College has appropriately seven hundred students in attendance.

TABLE I

	A		B		C		D		E		F	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per. cent.	No.	Per. cent.	No.	Per cent.
I	539	13	1,439	34.6	1,244	30	645	15.3	154	3.7	138	3.3
II	2,614	21.5	3,657	30	3,012	25	1,828	15	620	5	442	3.5
III	495	15.5	911	28.5	732	22.8	438	13.7	186	5.8	437	13.7
IV	386	26.8	455	31.7	346	24.1	123	8.5	72	5	50	3.4
V (N)[2]	268	27.5	385	39.6	227	23.5	0	0	51	5.2	41	4.2
VI	1,883	19	2,564	26	2,459	25	1,327	13	439	4.4	652	6.6
VII	529	19.3	1,093	39.8	723	26.4	243	8.9	71	2.6	83	3
VIII	542	21.1	972	37.8	616	23.6	260	10.1	110	4.3	68	2.2
IX	66	13.3	118	23.7	94	19	68	13.6	113	22.6	39	7.8
X (N)	164	16	430	42	298	29	0	0	105	10	24	2.3
XI (N)	252	18.4	489	35.6	559	40	0	0	46	4	26	2
XII	253	38	292	44	62	9.3	28	4.2	13	2	17	2.5
Total	7,991	19.9	12,805	31.9	10,372	25.8	4,960	12.3	1,980	4.9	2,017	5

Colleges I, V, X and XI are on the quarter basis; the others are on the semester basis.

[2] Grades here are for the second quarter instead of the first quarter.

Obviously, then, it is impossible to speak of college standards with any accuracy of meaning. It seems anomalous that the higher institutions of learning should be so unscientific in their own processes. Their purpose is to develop scientific men and women who shall in the world of affairs bring order out of chaos and system out of confusion. And, yet, those institutions are employing little system or science in the processes employed in training, or at least in rating those whom they are sending forth into the state and nation. What is true in Alabama is doubtless true in other states; in fact, in every state where the colleges have not worked together to make uniform their methods of rating the students in training.

The deplorable lack of interest in scholarship on the part of the general public and student bodies is often commented upon by college authorities and teachers. There is the general inclination to blame the "people" and the trend of the times for this condition; however, a careful analysis of the situation which reveals the lack of any uniform standards of scholarship on the part of colleges leads one to the conclusion that the fault is not to be found anywhere except in the colleges themselves. High and uniform standards of scholarship will undoubtedly create an interest in it and the opposite is bound to destroy that interest.

One of the paramount problems, therefore, of higher education would seem to be that of standardizing not only the instruction given but the rating of those instructed, because only in this way can one create a desire for high scholarship.

The old University of Oxford in England grants the degree of bachelor of arts in two grades, "pass" and "honors." In addition to that there are four classes of "honors" degrees —first, second, third and fourth. Thus there are five different classes of graduates turned out from the institution. This system has existed over a long period of time. The result is that the general public recognizes the value of a "first" from Oxford and the young man who attains this high distinction is recognized as one of the leading minds of the empire. The one who secures "second," "third" or "fourth" class ranking is considered in accordance with the class which he has made. The result is that the student in residence at the university has a keen desire to make as high class as possible. A high scholarship record is not considered bad form, as it is by some American students, but a thing very much to be sought after and to be prized when attained.

Could this same attitude not be effected, to some extent at least, by standardizing the rating of students by colleges? It might be at least the beginning of an interest in scholarship which would not only be very helpful in the higher institutions but would be reflected in the lower schools as well.

It has seemed strange to the writer that accrediting or standardizing agencies should have concerned themselves so much with the physical equipment, monetary endowment, the salary of professors and the size of the classes when they did not attempt in any way to find out the standards of scholarship within the institutions whose applications they were considering. Surely the standard institutions should have a standard system of grading or rating its students.

The distribution of grades in various departments has been compiled. English has the lowest percentage of A's of any subject in the curriculum. It is also noteworthy that practically without exception there was a larger percentage of B's given than any other grade. The only exception to this is the subject of mathematics. In this subject the percentage of E's and F's is higher than the percentage of B's or A's, though not quite as high as the percentage of C's and D's.

By careful examination of the percentages given by the various colleges in the various subjects, one is amazed to find how lacking in uniformity the various institutions are. The writer has given the number of grades as well as the percentage in each case in order that one may be able to judge whether the percentage is to be taken seriously or not.

It is the hope of the writer that the publication of these results may stimulate other colleges to make similar investigations. The colleges represented in the investigation include all the institutions in Alabama accredited to do college work save two. It would be exceedingly interesting and valuable if one could have a similar analysis of the grading of the various colleges that belong to the Southern Association.

O. C. Carmichael